LS Decay Search

R.Rameika

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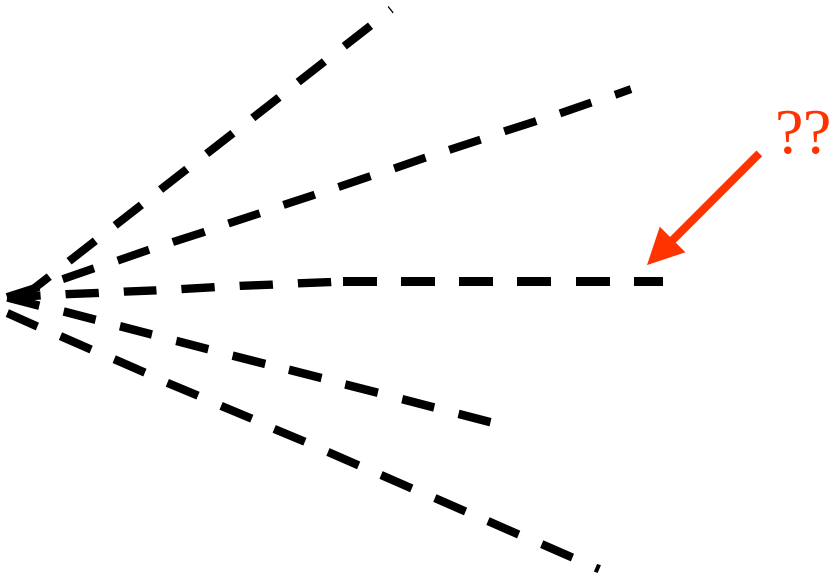
Outline

- Method
- Alignment and Resolution from Penetrating Tracks
- Monte Carlo Check of Algorithm and Sensitivity
- Next Steps
  - Refinement of algorithm
  - Further Monte Carlo Studies
  - Data Analysis

Method

Examine all primary vertex tracks to determine if they have a better fit to a small kink hypothesis rather than to a single straight track.

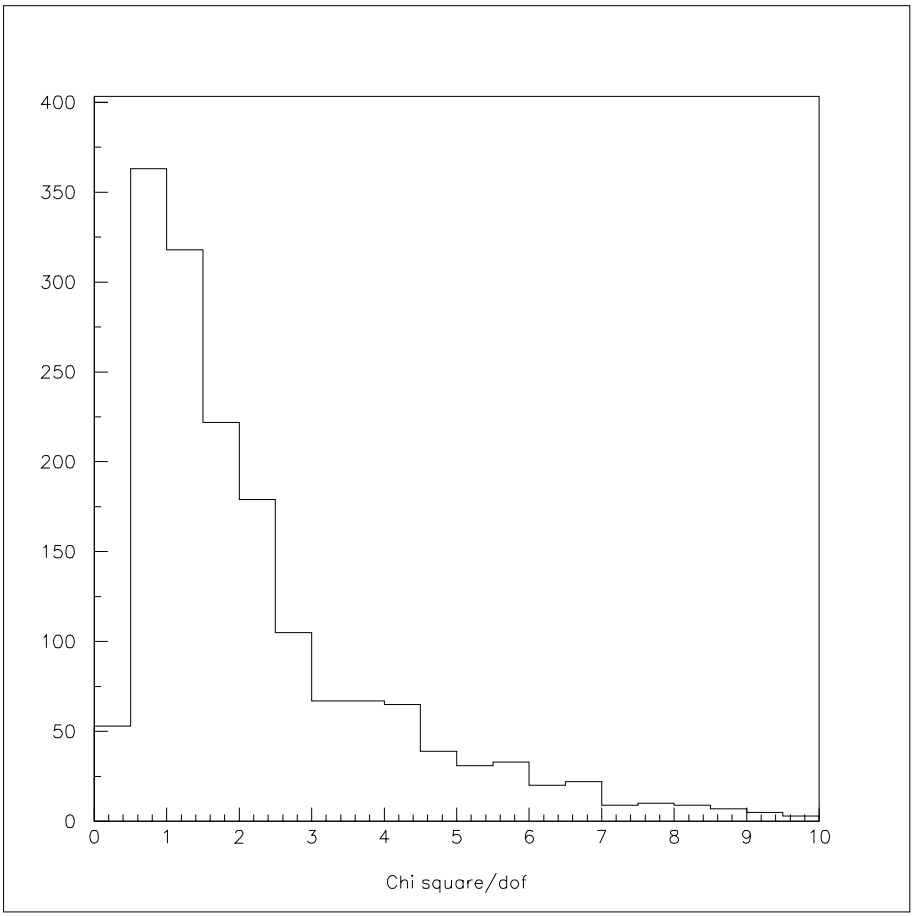


Use track segment positions and χ^2 fits.

χ^2 Distribution of Penetrating Tracks

This particular event had 1753 penetrating tracks; 1627 have χ^2 less than 10.

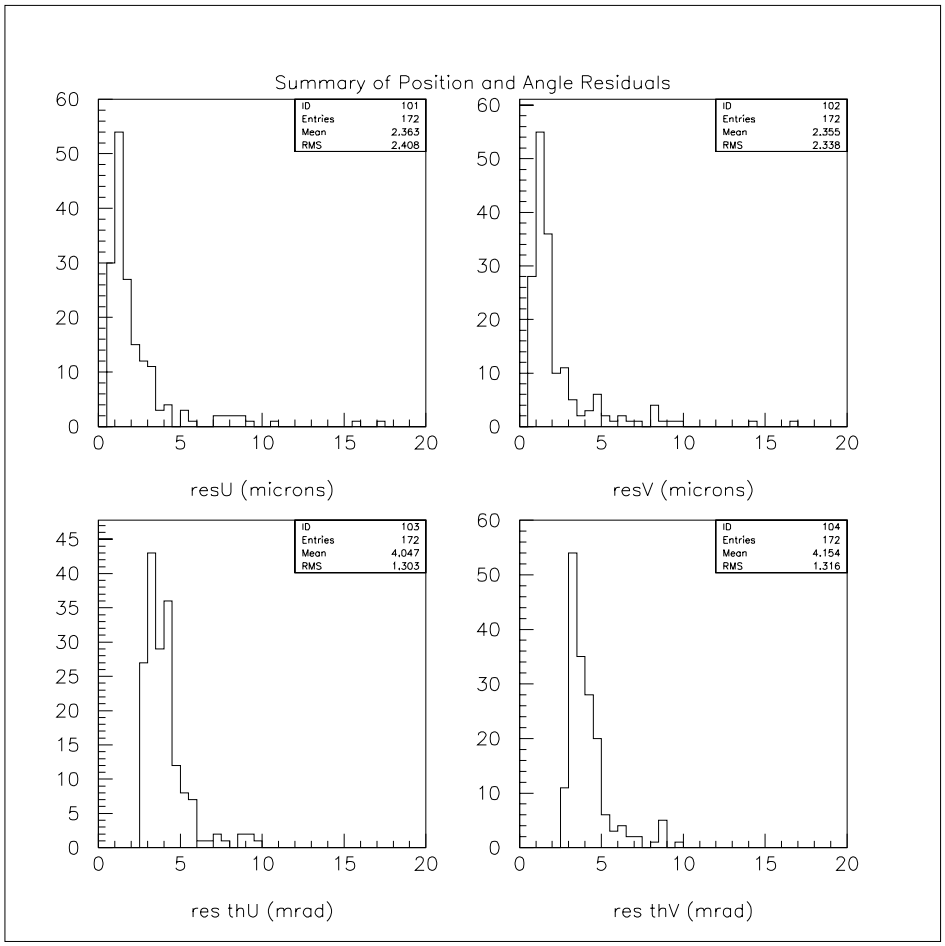
(Obviously, if all tracks were formed with “acceptable” χ^2 this analysis would not make sense. In the real events It’s the tracks with large χ^2 that are interesting.)



Resolution

To first order determined by the penetrating tracks in the vicinity of the located event.

I have analyzed ~170 events to determine an overall resolution for the data set.



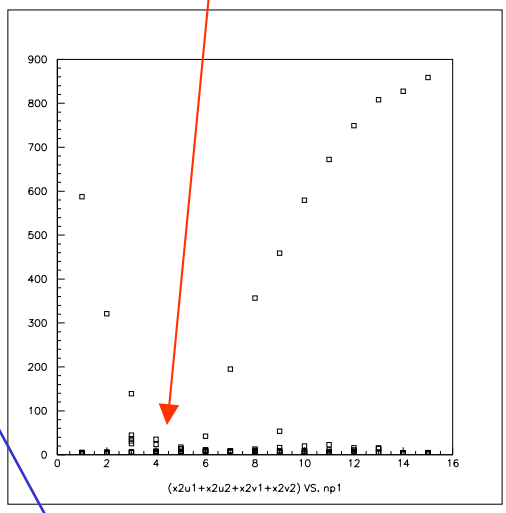
Alignment

Can be improved by adjustments made
Event by event and plate by plate to center
the residuals.

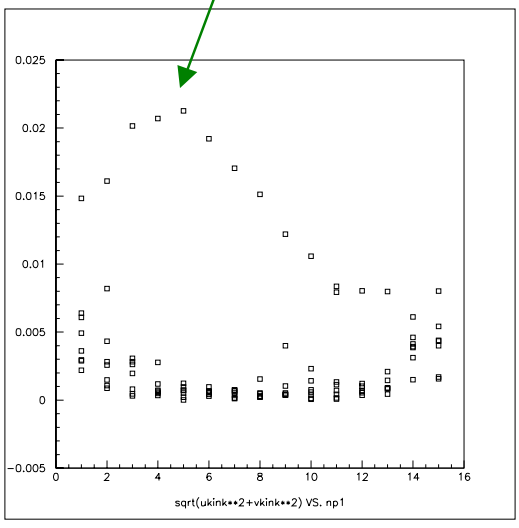
I will demonstrate this next time and
summarize the significance.

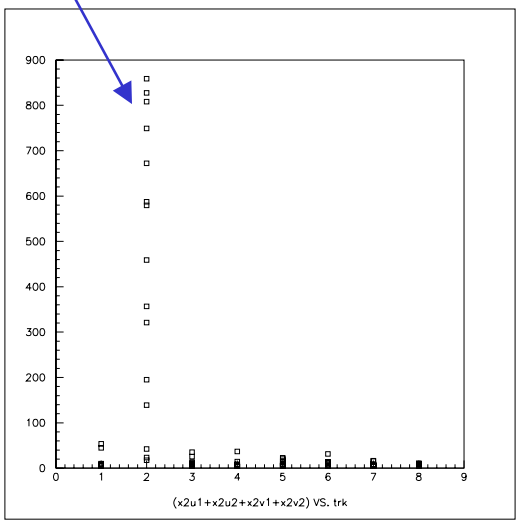
Monte Carlo Tests

Step #1:
Input : 8 track vertex, with a kink
on Track 2, between plate 5 and 6.

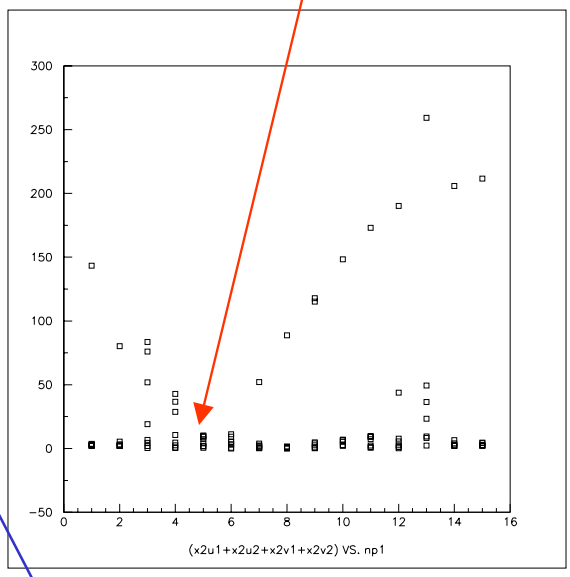


Input = 20 mrad kink

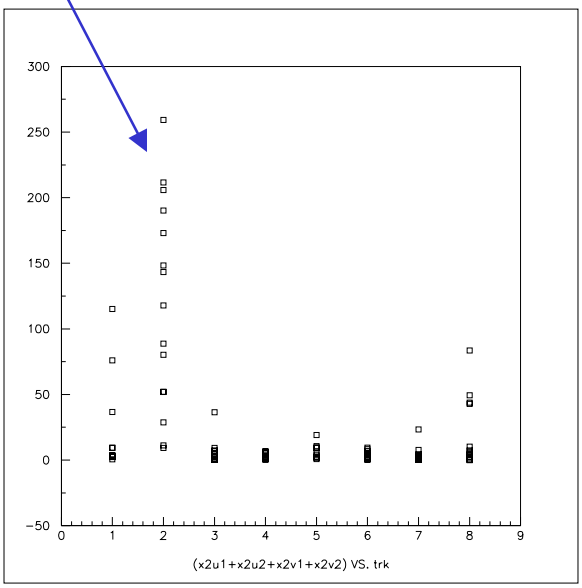


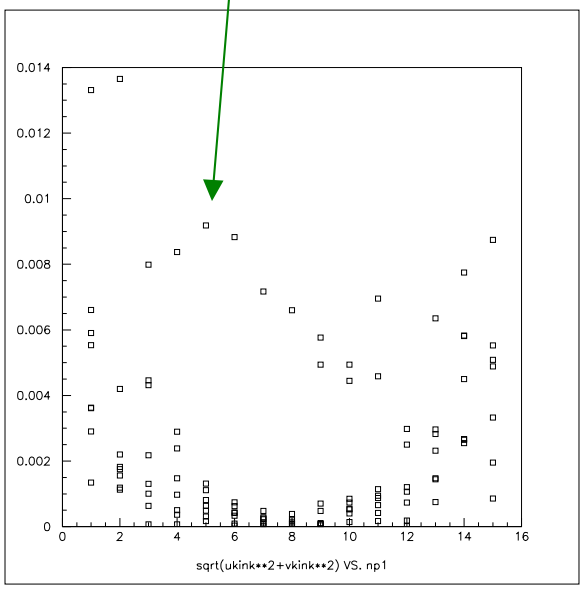


Input : 8 track vertex, with a kink on Track 2, between plate 5 and 6.



Input = 10 mrad kink





Kink Search Summary
(5 test points)

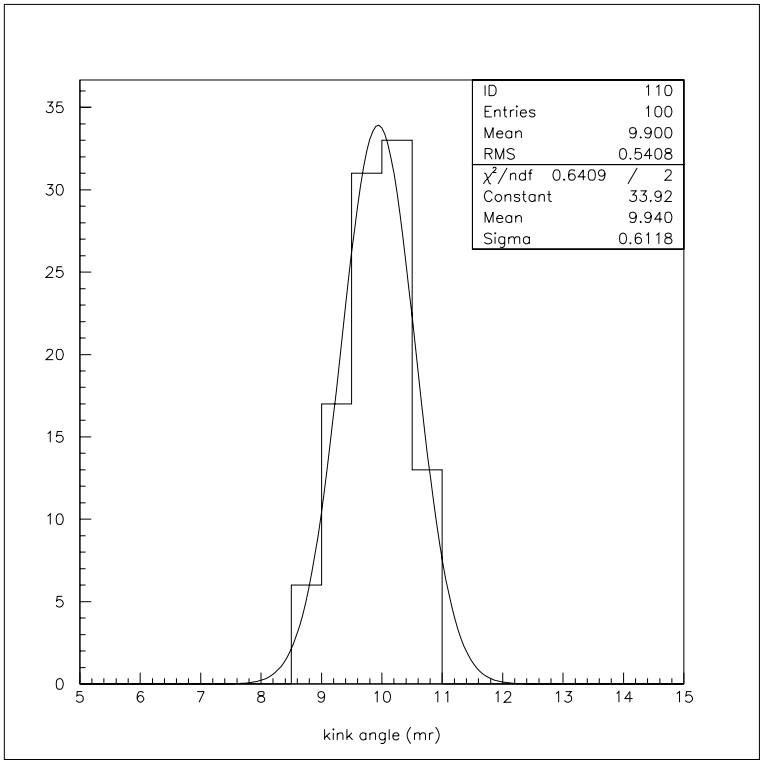
Input Angle	Kink Track	Kink Plate	A= χ^2_{kink}	B= χ^2_{others}	A/B	Θ_{kink}
20	2	5	6640	125	53	21.3
15	2	4	3820	130	29	15.5
10	2	5	1770	120	15	9.2
5	2	4	580	125	5	6.0
0	1	10	160	125	1.3	2.3

Monte Carlo Test

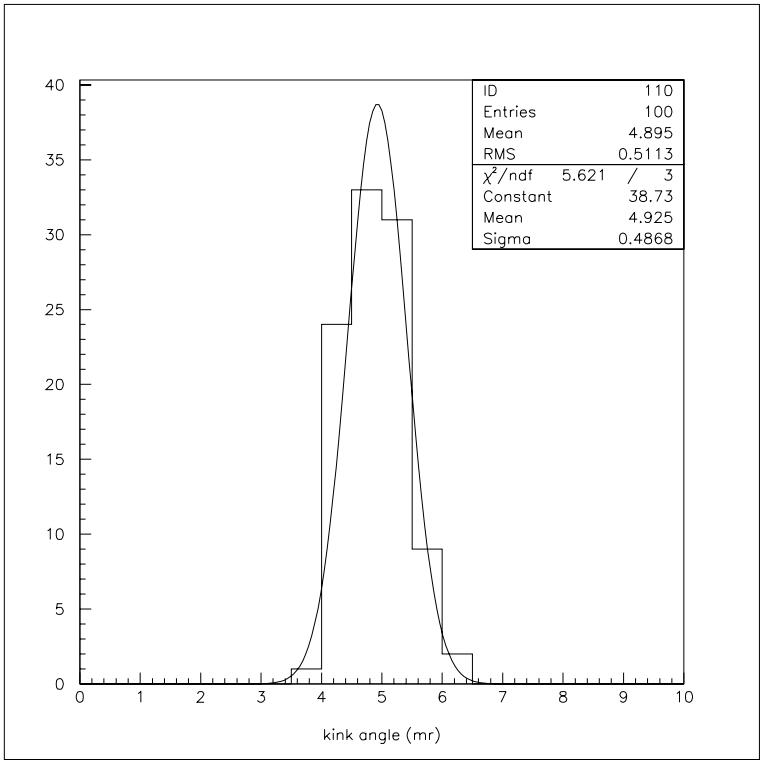
Step #2:
Perform search for 100 events.

Step #2a : Kink = 10 mrad
Step #2b : Kink = 5 mrad

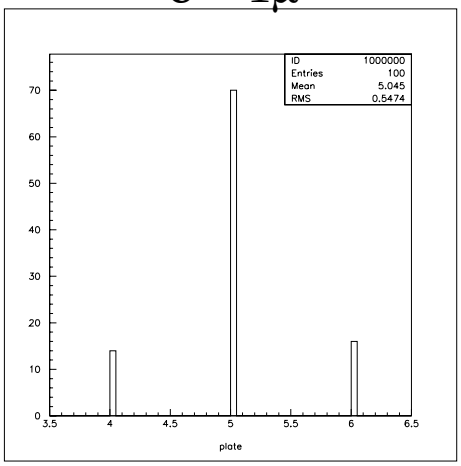
Input Kink = 10 mr



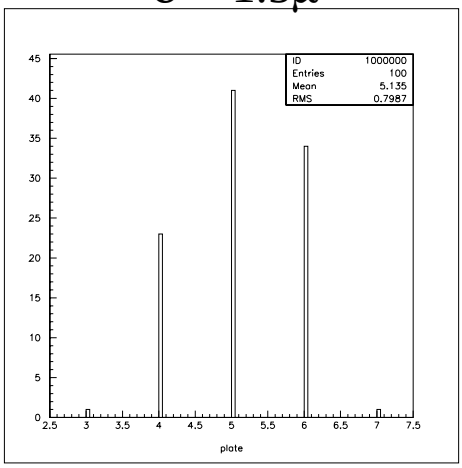
Input Kink = 5mr



σ = 1μ

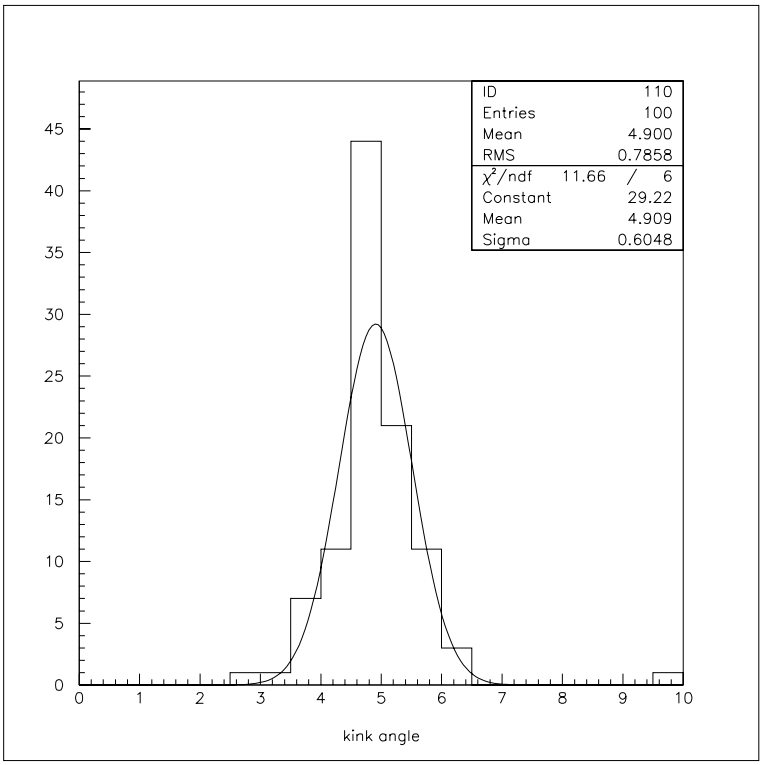


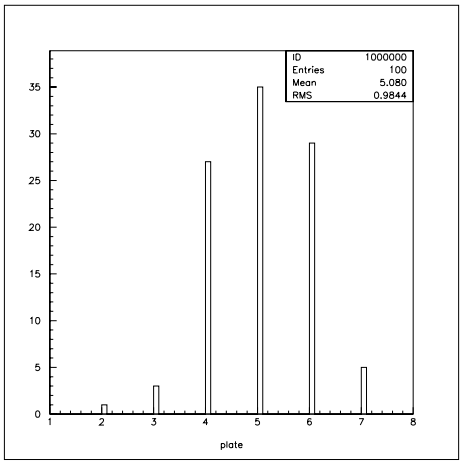
σ = 1.5μ



Monte Carlo Test

Step #3
Increase position resolution from 1 micron to 1.5 microns





Monte Carlo Test

Step#4
Move kink upstream
(between plate 2 and 3)

Next time!

Next Steps

- Complete MC studies required to summarize limitations of the search
- Implement event dependent alignment corrections
- Run Search on located events
- Begin study of kink candidates